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USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

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B. BAL'MONT INTERVIEWED ON START OF ECONOMIC EXPERIMENT

Moscow EKONOMICHESKAYA GAZETA in Russian No 2, Jan 85 p 6

[Interview with B. V. Bal'mont, minister of the machine tool and tool building industry; date and place not specified: "Ministry Begins Experiment"]

> [Text] Beginning in 1985 the scope of application of the economic experiment which has been underway since 1 January 1984 in five sectors of industry will be expanded. Beginning on 1 January 1985 five more union ministries will be included. Among them is the Ministry of the Machine Tool and Tool Building Industry. B. V. Bal'mont, minister of the machine tool and tool building industry, tells our readers about the preparation carried out in that sector in connection with the transition to experimental conditions.

[Question] Boris Vladimirovich, please tell us about the preparatory work conducted in your sector in connection with the transition to the experiment.

[Answer] We began this work long before the beginning of the experiment, with preparation for the transition being conducted at all administrative levels. By special order basic organizational measures throughout the ministry were set forth, the composition of the central steering commission for the experiment was determined and a list of basic associations and enterprises where the progress of the experiment would be studied was drawn up. Similar commissions were created in each of the All-Union Production Associations, in production associations and in enterprises.

At the proper time, several months before the beginning of the experiment, associations and enterprises were informed of financial quotas, production plans broken down by product type, goals for labor productivity increases and maximum level of expenditures per ruble of products marketed, and several other indices. In accordance with these quotas the enterprises have already calculated plans for volume of goods to be produced and absolute dimensions of capital funds to be used for salaries and financial incentives and presented them to the All-Union Production Associations. Under the new conditions enterprises are granted broader rights to take initiative and mobilize additional resources, beginning with the actual plan compilation process.

We devoted particular attention to cadre training. We carefully studied the experiences of ministries which had operated under experimental conditions in 1984. Six regional conferences were held for the managerial staff of associations and enterprises and financial, technical, marketing and other services, as well as for Party committee secretaries. Training sessions were also organized within the enterprises. Short leaflets for workers, brigade leaders and engineering and technical workers, in which the basic principles of the experiment were summarized and the tasks of specific workers defined, aided greatly in the explanatory work.

[Question] As you have already noted, under experimental conditions the enterprises are given broader rights in the realm of planning, which allows them to conduct a more effective search for production resources, beginning at the stage when the plan is being drawn up. To what degree did this allow for an improvement in 1985 plan indices?

[Answer] First of all I would like to remark that we had created a good basis for successful work under experimental conditions: the 1984 plan for marketing of goods was fulfilled by the ministry as a whole by 101.3 percent. Labor productivity rose by 1 percent above plan and production overhead was lowered by .5 percent above plan. This was in line with the socialist obligations which the sector's labor collectives had accepted.

Nevertheless, there remains even more to be done in 1985: the plan for the final year of the five-year plan is more ambitious, as compared to 1984.

The rate of increase in labor productivity for 1985 was to have been 6 percent. However, the collectives in this sector which are participating in the experiment have pledged themselves to work even harder: according to our socialist obligations, the rate of increase in labor productivity will be 6.5 percent in 1985.

We also found a way to improve the plan index governing the lowering of the maximum level of expenditures. The sector's socialist obligations envisage this index at around 2.2 percent.

The initiative by association and enterprise collectives which succeeded in making use of their expanded rights during the 1985 plan compilation process to mobilize additional production resources and on that basis improve their plan indices plays an important role in the setting of such intensive goals for the sector as a whole. Thus, the collective of the Odessa Precision Machine Tool Plant imeni XXV s"yezda KPSS pledged to raise labor productivity by 1.2 percent and lower overhead by .6 percent, i.e. by 117,000 rubles, above and beyond the ministry plan goals. The collective of the Ivanovskiy Machine Tool Production Association decided to increase productivity by an additional 1 percent above plan, which would guarantee an 8.5 percent growth rate in productivity as compared to the preceeding year, and to reduce overhead on goods produced by .5 percent above the plan goal. There are many such examples.

The initiative by many of the sector's collectives to effect above-plan conservation in enterprises and seek out new production resources so as to be able to

work for two days in 1985 on the stock, raw materials and fuel thereby saved has great significance for the successful fulfillment of the ministry goal for the reduction of level of expenditures.

[Question] The experiment creates far-reaching possibilities for speeding up scientific and technical progress and applying its achievements in production. How is it proposed to utilize these possibilities in 1985?

[Answer] The 1985 plan aims for a significant increase in the technical level of goods produced and accelerated application of advances in scientific and technical progress to the production process. Production of advanced automated types of equipment will grow at a tremendous pace. In 1985 manufacturing of special, specialized and standard-unit machine tools must be increased by 12.3 percent (in terms of product value) and machine tools with computer numerical control by 42 percent (in number of units produced). While problems are being resolved with regard to expansion of production of advanced types of goods work will continue on the creation of a scientific and technical stockpile for the first years of the new five-year plan and on the raising of the technical level and quality of all goods produced.

The plan for scientific and technical development foresees the creation of 720 prototypes and the putting into production of 620 stand-alone series of items. Among the new items will be 50 models of machine tools with computer numerical control and machining centers, 70 models of automatic and semiautomatic machinery from all technical groups, 16 models of variable-function production modules, units and systems, which allow the realization of automated production and the introduction of labor- and resource-saving technical processes. At the same time it is essential to take steps to remove 269 items from production as part of a planned replacement program.

We understand, however, that the organizing of work to introduce scientific and technical advances into production does not yet fully measure up to the tasks which we face.

In the course of the experiment effective levers and methods must be worked out to permit the mobilization of internal resources for the speeding up of scientific and technical progress, economical utilization of resources and an increase in product quality and production efficiency.

[Question] Under experimental conditions the volume of sales of goods produced, taking into account delivery obligations in accordance with contracts agreed upon, becomes the basic index for evaluation. How does the situation look right now with regard to the fulfillment of contractual obligations, and what has been done to improve this work under experimental conditions?

[Answer] In 1984, according to preliminary statistics, the plan for sales volume according to delivery on contract was fulfilled in this sector by 98.8 percent. Under experimental conditions that result, you understand, could not be considered a success. Therefore right now we are emphasizing special attention to matters pertaining to delivery discipline.

In good time, before the beginning of 1985, enterprises allotted the requisite funds for material resources. Work on the conclusion of contract for the delivery of goods in 1985 was conducted with marketing organizations and clients, preceeding from the established plan and its quarterly divisions. In doing so we attempted to obtain the maximum reduction in the number of non-transit shipments.

The mechanism of economic incentive is now, as you know, also directed toward strengthening delivery discipline. Just how effective the incentive system is under the new conditions, and how tangible the gain for collectives in enterprises, is illustrated by this example.

In our sector 160 enterprises successfully handled their contract shipments in 1984. If they had at that time already been working under experimental conditions, then they would have had the right to have added and additional 13 million rubles to the material incentive fund. As we see, a goodly sum with which to stimulate collectives.

I would like to emphasize once again that in 1985 we are faced with large and crucial tasks. We are certain that the far-reaching rights and opportunities which the economic experiment presents will help the association and enterprise collectives of our sector to mobilize new reserves in 1985, with the goal of successfully coping with plans and obligations for the 11th Five-Year Plan and creating a good basis for shock work in the next five-year plan.

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PRELIMINARY RESULTS OF ECONOMIC EXPERIMENT REVIEWED

Moscow MASHINOSTROITEL' in Russian No 7, Jul 84 pp 1-2

[Article by N.S.Posysayev: "Experiment in Progress"]

[Text] The industry of the country has over the past few months been conducting an experiment involving the expansion of enterprises' rights and the heightening of their responsibilities. During that time the participating plants showed a marked improvement in fulfilling their contractual obligations and accelerating the productivity growth rate. A significant above-plan increase in productivity was, for example, achieved by enterprises of the Ministry of Heavy and Transport Machine Building (Mintyazhmash) and the Ministry of the Electrical Equipment Industry (Minelektrotekhprom). At the start of the year many plants set out to overfulfil their assignments for consumer goods output.

In the first quarter of this year Mintyazhmash enterprises improved their performance over the corresponding period of the year before. The increment in commodity production was 4.6 percent (against 3.7 percent) and it stemmed entirely from an increase in productivity (5.3 against 4.6 percent). Production costs fell by 1.4 percent against 0.9 percent last year. Particularly important is the fact that 99.8 percent of output was sold to customers by contract. Last year the figure was 94.5 percent. The number of enterprises not fulfilling their contractual obligations dwindled more than fivefold. This allows to conclude that a number of the experiment's provision's plus the introduction of stable norms makes for better end results. Another positive factor was the fact thar Gosplan USSR handed down the sectorial plans at an earlier stage and that all subdivisions were briefed more exhaustively on the importance of improving their economic performance.

A significant achievement of the experiment's participants is the stabilization of their production rhythm - there are no more stoppages or crash work. For example, the Novokramatorskiy Machine Building plant imeni V.I.Lenin fulfilled its contractual obligations on deliveries 100 percent; productivity rose 6 percent; profits earned and and costs sustained were as planned.

In all, the groundwork for successful work by the enterprises involved in the experiment has been laid. Many Mintyazhmash plants now have precisely defined production and supply plans, due attention is being given to the compatibility of production facilities, the liquidation of bottlenecks and the strengthening of supply discipline. Economic contracts have gained in prestige in that their fulfilment directly influences the amount of monies transferable to the plant's material incentive funds.

The strategic goal of the experiment is to have the enterprises arrive at the start of the twelfth five-year plan with a well-tuned economic and production mechanism that would allow them to make fuller use of the opportunities inherent in our national economy. The new levers and stimuli introduced by the experiment together with the development of democratic principles in the supervision of the national economy serve to improve and strengthen centralized control of the economy and expand the role of labor collectives in the exercise of that control. Mintyazhmash collectives, for example, have made a commitment to master and modernize hundreds of types of new machinery and achieve an economy of 3 billion rubles during the current five-year plan period.

The experiment provides for a reduction in the number of indicators planned by the ministry. The enterprises have in large measure been freed of its supervision which has allowed for an objective evaluation of management's leadership capabilities, the quality of its decisions and its ability to direct the collective's efforts at heightening the effectiveness and quality of the work process. For example, the use of stable, long-term norms creates a situation whereby the size of the funds allocated for wages, social development, technical modernization and retooling depends directly on the results achieved. This means that the collective will get its funds only if it functions effectively. The experiment's provisions are such as to necessitate the activization of the work performed by the plant's technical and economic sectors and a major improvement in intraenterprise planning.

The second most important step after the organization of science and production associations was the experiment conducted by five Leningrad enterprises aimed at improving the wage system for designers and technologists. This measure was an offshoot of the struggle to raise work discipline and improve work organization. In the course of the experiment as conducted by the production association Elektrosila imeni S.M.Kirov its engineering personnel was subjected to a creativity aptitute test which resulted in about 200 persons being freed for other duties with their wage fund used to raise the pay of those staying on. This did not lead to any changes in assignment times or blueprint completion schedules.

Abolished in the course of the experiment were close to 30 subdivisions (departments, sectors, laboratories) whose existence was

not essential to the production process. Several cost-accounting teams of designers and technologists were created with the wage fund apportioned according to each member's coefficient of labor participation.

The 26th Congress of the CPSU inderlined the need to strengthen executory discipline and streamline ties between cooperating enterprises. One of Elektrosila's subcontractors, for example, had over a number of years been supplying the association with a forging whose allowance was far in excess of the prescribed 5 millimeters (a so-called "black forging") which led to about 40 percent of the metal going into shavings. No amount of persuasion could make the supplier see reason. It was only the experiment that finally put an end to the waste. Another Leningrad enterprise, the Krasnyy Vyborzhets, supplied Elektrosila with flat rolled metal for rotor coils even though shaperolled metal was economically more feasible for the association. After the two enterprises signed a cooperation agreement deliveries of the shaped metal parts became possible, signifying a savings of 6 tons of copper on each generator. For Elektrosila the economic effect adds up to 30 million rubles a year. According to the terms of the experiment, a significant part of this sum now goes into the enterprise development fund for retooling. This means that the Elektrosila production association no longer relies on the ministry to fund such projects.

Taking an active part in the experiment is the production association Elektrostal'tyazhmash. It has before it a number of major tasks: elevate the production process to a high level of efficiency, achieve maximum economy of labor and material resources, carry out all its contractual obligations without exception, meet its delivery deadlines. In 1984 the association concluded nearly 300 agreements with recipients of its goods. 20 percent of these contracts are long-term plant-to-plant commitments, with deliveries of equipment for underway projects stipulated by the quarter. Design projects for new rolling and tube mills have been completed; when these are commissioned the national economy stands to save 25 million rubles. The utilization of semifinished parts cross-rolled by these mills as close as possible in size and shape to the finished detail will save 900 tons of metal a year. New equipment for thermal processing of pipes has been designed. This will increase their durability and thus allow thinner sheets to be used for their sides,thereby saving a significant amount of metal.

Savings likewise accrue by upping the equipment's unit capacity. Thus, with the creation of two-track cold-rolling tube mills output volume increased three to fourfold.

A decision has been handed down on the question of pre-deliveries: the enterprises participating in the experiment have been granted the right to procure materials ahead of schedule, though within the prescribed limits. Consequently, it is now up to the associa-

tion itself to make full use of the opportunities presented by direct contractual links between cooperating enterprises. In the opinion of the association, if the collective is to function properly, unhampered by bottlenecks or interruptions, the list of new projects and equipment should be approved at least two years in advance. As it is, even the preliminary plan for the year the experiment began was received only in June 1983.

The terms of the agreement mandate the presence in five-year plans of an officially approved list of equipment (specifying the individual types involved) which have a five-year production cycle. All questions relating to the balancing of production plans, especially material and technical supply, must be resolved in the course of the experiment.

In readying itself for the economic experiment the Andropovskiy Cable Works defined the three main directions of its development: comprehensive reconstruction of the plant (the systematic transformation of its whole way of life); technical development (reducing the proportion of low-skill jobs, raising the educational level of the workers, replacing obsolete technological processes and machines, lowering cadre turnover, upping labor productivity, improving living conditions); the gearing of production to fulfil next year's plan. The enterprise's current plans were radically changed in that they were brought into harmony with each other and given dynamic movement toward growth, all production and control functions were demarcated: current, everyday problems are handled by section supervisors, shift chiefs, senior or shift foremen, long-term problems - by the plant's chief specialists. As yet unresolved is the question of sales - the plant's output is dispatched to thousands of addresses. The enterprises has come up with a proposal whereby its products would be shipped not to consumers, but directly to distributing organizations. This will entail the creation of wholesale cableware bases.

The economic experiment is working well at the Barnaul Transport Machine Plant imeni V.I.Lenin. Having successfully fulfilled the plan for 1983, this year it is well on the road to achieving a 1 percent above-plan increase in productivity and an 0.5 percent reduction in costs. The terms of the experiment make the size of contributions to the material incentive fund contingent on the rate of cost reduction (for each percentage point of reduction the annual fund goes up by 5 percent).

The plant has worked out and is incorporating into production technical measures aimed at reducing material and labor outlays. With these in mind, the collective has discovered new reserves and adopted the following socialist obligations for 1984: achieve an economy of 75 tons of ferrous metals (compared to the norm); overfulfil by 25 percent the assignment for reduction of labor intensiveness; increase the machine shift coefficient by 5 percent.

The collective of the enterprise embarked on the experiment with high hopes for an in-depth development of cost-accounting relations. The solid groundwork for this had already been laid: 72 percent of the workers were members of teams working on a single (brigade) job order. This year 40 percent of all production workers will be drawn into cost-accounting teams. 60 additional teams of this type are to be organized. This progressive trend will be systematically developed as the proper conditions are created for the introduction of cost-accounting.

Every shop of the plant is looking for ways to further reduce production costs. One example is a proposal to forge crankshafts out of a shortened billet, which would save over 240 tons of metal a year. However, because the metallurgists of Cheliabinsk (in contrast to those of Zlatoust) refused to go along this idea was only half realized.

In its struggle to further lower production costs the collective of the plant resorts to a wide variety of means, including enrolment in the system of economic education and in schools of Communist labor. This fortifies the conviction of every member of the collective that thanks to the experiment the enterprise's plan as well as its socialist obligations will be fulfilled in their entirety.

To sum up: a strenuous plan and high obligations are often something of a risk. However, relying on the collective know-how and initiative of the workforce, the industrial manager must foresee the results of any measure he undertakes to advance the fulfilment of a strenuous program. Fewer reporting indicators and a shorter assortment of products handed down and controlled by higher organizations, a newly found independence in the matter of utilizing the plant's production development, sociocultural measures and housing construction funds all enable the enterprise to better respond to consumer demand, reach agreements with trade organizations to supply them only with goods that sell and for whose production the plant is truly ready. The risks that arise are worth taking: fulfilment of the overall sales plan, including contractual shipments, leads to an increase of 15 percent in the enterprise's material incentive fund; with each percentage point of underfulfilment, though, this fund undergoes a reduction of 3 percent. The economic experiment is a litmus test on whether the system of control reflects the current stage of the economy's development.

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AUTOMATED, ROBOTIZED FORGE-PRESS SYSTEMS VIEWED

Moscow KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO in Russian No 5, May 84 p 14

[Article by M. N. Khmel'nitskiy, director of the PKTIkuzrobot: "Robot Technical Automated Complexes for Forge-Press Equipment"]

[Text] The PKTIkuzrobot [Planning-Design and Technological Institute Forge Robot Building] developed models of industrial robots with load-lifting capacities of 0.08, 0.63, 1.25, 3.5, 10 and 40 kilograms, as well as manipulators with load-lifting capacities of 16 and 50 kilograms for forging rolls. Specialists of the institute are working successfully in such a progressive direction in developing robot equipment as the creation of unit design industrial robots. A series of such robots with a lifting capacity of 2.5 kilograms has already been developed. They are made up of nine basic standardized units (base, arm, turning device, etc.)* The unit principle of robot design increases their reliability, reduces manufacturing costs and times for introduction.

The institute developed over 35 models of forge-press equipment complexes and lines, 18 complexes applicable to existing production facilities; nine 63 to 630 kilonewton press complexes using robots with load-lifting capacities of 0.08 to 2.5 kg; four complexes for upsetting of hot parts with 1 to 4 meganewton screw presses and robots with 1.25 to 10 kg load-lifting capacities; two complexes using 25 to 40 meganewton hot extrusion crank presses with robots with load-lifting capacities of 10 and 40 kg, etc. Series production of five models of robots and models of typical complexes and lines was organized at the "Soyuzmash" VPO [All-Union Production Association] enterprises.

Institute specialists participated in introducing over 40 robot equipment complexes (RTK) and lines (RTL). An automated model AKKD2118A-2 was demonstrated at the International Spring Fair in Leipzig in 1983, where it was awarded a certificate and a gold medal. This complex, as well as the model L612 automatic line, complex models AKFB 1782A-1 and AKKB8544, manipulator model MKV-50 for forging rollers were operated at the permanent exhibit "Automatic manipulators" of the USSR VDNKH. They won certificates and 30 USSR VDNKH medals three gold, seven silver and 20 bronze. Moreover, in 1982, the model

* A. A. Krivitskiy, Yu. V. Mal'kov and B. I. Vatolin. "Unit Design Industrial Robots." KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO, 1984, No 1, pp 14-19

L612 line series manufactured by the Sal'sk KPO [Forge-Press Equipment] Plant was awarded the State Emblem of Quality. In spite of the great amount of work done on robot complex design, the process of their introduction remains fairly complicated. It requires the user to carry out a number of organizational-technical measures; the development of additional fixtures when preparing for the production of new products; changing the technology and combining, when necessary, certain technological operations; and touches practically all sides of the production activity of the enterprise.

It is necessary to take into account that only thoroughly thought-out and well-organized sections in which an entire series of technological operations is performed by robots, can be profitable. Robots should be introduced systematically, comprehensively over the entire technological cycle, from processing raw materials to obtaining the finished part (unit). Here, questions of transporting, tooling, warehousing and other questions using computers widely must be solved also.

The role of creating new types of products, developing new technological processes and organizing new production facilities, as a whole, belong to the technological services of the enterprise which must consider the possibility of machining parts and units on robotized technological complexes. However, the robot should not be considered some universal automating device whose use is advisable in all technological processes of forging. This question should be considered only as a new automation device which appeared in the technologist's arsenal, may be advisable to use in many cases. Only the national combination of the traditional means of automation with industrial robots will produce the greatest effect.

Practice shows that robots are introduced efficiently in enterprises where NC machine tools are used and the operating service is staffed with trained personnel. The Rostov-on-Don "Krasnyy Aksay" Production Association is an example of such an enterprise.

Specialists of the Simulation of Neuron Mechanisms and Robot Equipment Department of the NIInewrosybernetics of the Rostov State University, at the request of "Krasngy Aksay" developed a plan of optimal robotization of several leading shops of the enterprise. First stage technological processes have been determined, where robots could be used, and a group was created in the main technologist's department and developed technological processes and fixtures for equipment that uses robots; a robotization buro was organized which is involved in the introduction, adjustment and repairs of robots, and trains operational personnel.

Implementation of these measures made it possible to introduce, in a fairly short time, several automatic RTK and RTL, developed by the PKTIkuzrobot and other organizations.

What does the new equipment require?

First, high demands of people who work on preparatory operations to insure the quality of intermediate products specified by the technological process.

Practice shows that the robot is the best OTK [Quality Control Department] inspector and nonobservance of the requirement of the quality of intermediate products may lead to stopping of the entire RTK.

Second, strict monitoring of the tool's condition is necessary.

Third, high quality of design and manufacturing of robots themselves and their reliability and life are required. A failure in the operation of one robot system renders expensive equipment inoperative and reduces the efficiency of RTK operation. This, in its turn, applies also to pneumatic, hydraulic and electronic units which are used in robots, since the technical characteristics, reliability and life of robots depend on their components.

Fourth, is the requirement for the development of a series of loading-orienting and feeding devices without which it is impossible to expand the area of RTK application. Today, robots basically free man from dangerous and especially hard manual labor and, in such cases, social and technical aspects are placed on the front burner. Nor should one forget the economic aspect of the problem, because the results of the activity of the design organizations and enterprises that introduce the new equipment, are evaluated by the economic indicators of its introduction and by saving wages of freed workers.

In the very near future, a new scientific technological direction in robot equipment will develop greatly -- the creation of flexible production modules, used independently, as well as being built into flexible production sections, for cutting and bending rolled sheets, sheet stamping and producing articles from thermoplastic materials. Flexible production modules and sections have technological possibilities, and are equipped with magazines (warehouses) for intermediate and finished products, automatic feeds of initial materials and removal of finished products and wastes, and are also equipped with devices for a rapid change of dies and tools, automatic control system, including computers.

A prototype of an automatic module -- forging center -- a component part of a flexible production center -- was built by specialists of the Azov Special Design Buro of Forge-Press Equipment and Automatic Lines, for which the PKTI-kuzorobot developed a software control system.

This work is one of the stages for implementing the long-term plan for the 11th Five-Year Plan period which specifies a constant undeviating increase in the volumes of development and introduction of robots, automated complexes, lines, section and flexible automatic production facilities.

2291
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AUTOMATED PRODUCTION LINES FOR TRACTOR ENGINES

Moscow MOSKOVSKAYA PRAVDA in Russian 18 Sep 84 p 1

[Article "Achieved, Manufactured, Organized"]

[Text] The milling machine tool brigade of P. M. Kolchev of the "Pnevmoapparat" Production Association organized a new, high-speed method for milling parts. A special fixture provides pneumatic clamping, as well as the automatic turning of the part for the following milling operation. This method made it possible to increase the productivity of labor. The brigade collective adopted higher obligations in honor of the 40th Anniversary of the Great Victory: fulfill the five-year plan task by 9 May 1985.

The first three automatic lines of the complex for manufacturing the tractor were shipped to the customer by the "Stankoagregat" Plant. The entire complex consists of 12 automatic lines. The first two lines will have four robots each for automatically loading and unloading parts for preliminary machining on the machine tools. This made it possible to reduce hard manual labor and increase the productivity of labor greatly. The new technical solution will find application in other automatic systems. The output of the remaining lines of the complex will be completed this year.

Travel 500,000 kilometers without capital repairs -- this was the decision of the driving crew of the Second Bus Park, A. D. Voron and A. A. Gromov. The oldest workers in the enterprise, veterans of war and labor, adopted higher socialist obligations in honor of the 40th Anniversary of the Victory. They planned to save 1000 liters of gasoline per year. The initiative of experienced drivers was supported by young crew members Yu. Danilina and A. Cherkesova.

A new mechanized section for packaging the "Manpans'ye" caramels began operation at the "Rot front" Combine. The introduction of new equipment improved the quality and preservation of the sweet product.

2291
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AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

GROUPING, AUTOMATION OF NEW, RETROFITTED MACHINE TOOLS

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 1, Jan 84 pp 36-28

[Article by V. Kovalenko, deputy department manager and V. Kotov, manager of Minsk "Orgstankoprom" affiliate: "In Automatic Mode"]

[Text] The automation of basic technological processes has now reached such a level that auxiliary operations (such as transportation and warehousing parts, loading and unloading equipment done by existing facilities) have begun to slow down the productivity of labor. It is possible to overcome this gap by the comprehensive automation of sequentially interrelated technological processes.

Machine tool building organizations and enterprises have developed a number of comprehensive automated sections for machining housing parts (ASK) and solid of revolution parts (ASV). Automatic technological machining complexes are also being developed. Comprehensively automated sections and automated technological complexes include a set of metal-cutting machine tools (basically with NC); a transport-storage system; an automatic production preparation system; a group of centralized NC; a computer control complex; systems for tooling, accounting, planning and dispatching, quality control, and gathering and transporting chips.

In the last four years, the enterprises of the sector manufactured and delivered 36 automated complexes and sections for operation. The results, achieved in their operation, testify to the promise of these complexes and make it possible to change over to a new direction in machining parts in series production.

We are speaking about the use of industrial robots, which, having filled a lack, make it possible to solve the problems of comprehensive automation on a higher plane by combining the production facilities into a single automatic complex. Forty-eight models of experimental industrial robots were developed in the sector with 16 of them in series production, including 6 for servicing metal-cutting equipment.

Over 10,000 industrial robots and machine tool sets will be manufactured in this five-year plan period. Regrettably, they are being introduced in single units due to the unpreparedness of production and the lack of experience in operating them. This process is also slowed by the fact that many models of series produced metal-cutting equipment are not adapted to operating in automated sections; therefore, it is extremely difficult to couple them with industrial robots.

In our opinion, the creation of flexible production systems, operating in the "unmanned technology" mode, should be considered one of the basic directions in automating series production. Production cells that include a machine tool, industrial robot and auxiliary devices (magazine, loading device, storage unit, etc.) will play a leading role in this.

In working on projects of the reequipment of the servicing zone of machine tool building plants, the Minsk affiliate of the "Orgstankiprom" Institute prepared several technical proposals on developing automated machining sections. For the Minsk Machine Tool Building Plant imeni S. M. Kirov, for example, a technical proposal was developed for an automated section to machine chucks for broaching machine tools. The section will consist of technological complexes including industrial robots, NC lathes, a semiautomatic cylinder-and-cone grinding NC machine, NC horizontal-drilling-milling machine tools with tool magazines, as well as a transport-storage system. The distinctive feature of this section is the correlation between the operating cycle of robotized technological complexes and the transport-storage system obtained by feeding oriented intermediate products and special packing to the stepping loading device, built directly into the shelving of the transport-storage system.

A technical proposal was also made to organize an automated section for machining shaft type parts at the Leningrad Machine Tool Production Association imeni Ya. M. Sverdlov. This section will be composed of three robotized complexes. An automated interoperation transport-storage system, developed by the "Orgstankimprom" Scientific Production Association, will be used. All this will make possible the comprehensive automation the following: the delivery of intermediate products in special packing by a stacker crane to magazines and the return of the machined parts to the transport-storage system; the cycle of installing, removing and machining parts in the robotized technological complex; transmission of tool adjustments from the tooling section of the monitoring-dispatcher post to work positions. The feed of intermediate products and the delivery of parts to loading-unloading positions, as well as setting up and removing parts from machine tools without robots will be mechanized.

The introduction of robotized technological complexes makes it possible to create fully automatic sections, linked by a single transportation storage system and using "unmanned technology."

2291
CSO: 1823/104

BRIEFS

ROBOTIZED COMPLEXES -- Vilnius -- A robotized complex was placed in operation at an NC machine tool section of the Vil'nyus Grinding Machine Tools Plant. It was created according to a plan of comprehensive mechanization and automation of the enterprise. Specialists estimated that the use of robots will more than double the productivity of labor. The enterprise is getting ready to place in operation one more gantry robot which will service two lathes simultaneously. [By L. Greysas] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 23 Aug 84 p 2] 2291

CSO: 1823/104

ROBOTICS

UDC 621.7.07.001

ROBOTS FOR APPLICATION IN FORGE-PRESS OPERATION

Moscow KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO in Russian No 5, May 84 pp 39-46

[Article by L. M. Orestova: "Industrial Robots and Manipulators for Forge-Press Operation (Review)"]

[Text] Achievements in the area of creating and introducing industrial robots and manipulators are represented widely at the "Progress-83" Interindustrial Exhibition. Modular design robots, with NC positional and contour systems were exhibited, as well as robots built directly into the technological equipment.

The RPM modular industrial robot is designed to automate basic and auxiliary technological processes in machinebuilding (hot and cold die forgings and sheet presswork, heat treatment, etc.).

It is composed of a set of independent design modules. A system of 15 modules makes it possible to assemble 100 versions of robots for various purposes (stationary, mobile, floor, overhead, etc.). A possibility is there of developing and modernizing the modular system.

Specifications

Lifting capacity, kg	25
Degree of mobilities	6
Type of drive	DC electrical
Control system	UPM-772 positional NC (can be made with an APS-1 analog-positional system)
Highest positioning error, mm	±1
Largest radius of action, m	2.1
Volume of working zone, m^3	16
Value and speed of motion according to degree of mobility, degrees, (degree/sec):	
arm:	
rotation with respect to vertical axis	300 (110)
rocking with respect to lower axis	90 (45)
rocking with respect to upper axis	75 (45)

wrist:	
rotation	300 (150)
flexure	180 (100)
rotation of grip	300 (180)
Size, mm	1700 x 1000 x 1610
Weight of manipulator, kg	1510

The group introduction of robots (3 to 5 units) with two-shift operation frees 4 to 6 workers.

Annual saving per one introduced robot is 5000 to 7000 rubles.

The robot may be built into flexible production systems by a nonstandard communications channel with technological equipment.

Address for requesting documents and data 107053, Moscow, B-53, TsNIIinformatsiya.

The MRU-902 angular manipulator is designed for loading-unloading, transport and assembly operations. It can also be used for materials handling of technological equipment (assembly, pressing, etc) in a set with orienting devices, as well as for gathering part sets and part stacking operations.

Specifications	
Lifting capacity, kg	0.5
Arm parameters:	
rotation angle, degree	35-90
vertical stroke, mm	5-30
overhang from rotation axis (max.), mm	300
Precision of positioning, mm	±0.02
Cycle time, seconds	3
Operating mode	Automatic, adjustable
Drive	Electromechanical, reversible
AC power source:	
voltage, volts	220
frequency, Hz	50
Power consumption (not greater than), watts	300
Number of technological instructions	4; 8
Method for time assignments of technological instructions	Cams
Signals for technological instructions	Electrical
Size, mm	338 x 536 x 445
Weight, kg	38

The manipulator produces a smooth revolution angle and is highly precise in the entire range of the rotation angle of the arm, provided by the smooth control of the clamping force of the arm against the limit stops.

The annual saving is 10,000 rubles.

Address for requesting documents and data: 107005, Moscow, B-5. "Volna" Scientific Technical Information Center.

The AMPPU-3 NC automatic manipulator is designed to automate the transferring of products between technological units.

Specifications	
Loading lifting capacity, kg	25
Number of degrees of mobility	5
Linear motions of arm, mm:	
horizontal	300
vertical	300
Speed of linear motions, m/sec	0.5
Rotation, degrees:	
arm around vertical axis	60 - 220
grip around longitudinal axis	90
wrist	90
Type of drive	Pneumatic
Size, mm	1290 x 540 x 1185
Weight, kg	400

Annual saving is 2000 rubles per manipulator.

Address for requesting documentation and data: 115148, Moscow, M-148, TsNIINTI.

MRL-200-901A Linear Manipulator is designed for loading-unloading, transport and basic technological operations in automated assembly equipment, as well as in automatic loading devices for stamping, machining and other types of equipment.

Standard devices can be used to feed intermediate products, as well as cellular cassettes with a capacity of up to a 100 pieces, mounted on MPKD type devices.

Specifications	
Load lifting capacity, kg	0.5
Linear motion, mm:	
horizontal	200
vertical	60
Number of intermediate positions in horizontal motion	up to 10
Positioning precision, mm	± 0.02
Drive	Pneumatic
Control system	ESU-90
AC power supply:	
voltage, volts	220
frequency, Hz	50
Pneumatic network, megaPa	0.2-0.4
Size (without control system), mm	516 x 204 x 255
Weight (without control system), kg	14.5

Special features of the modular type manipulator are: simplicity of design; modules can be used independently in various combinations of assembly machines; and stepping motion is possible in the horizontal stroke.

Annual saving is 10,000 rubles.

Address for requesting documentation and data is: 107005, Moscow, B-5. "Volna" Scientific Technical Information Center.

The SM-100 balanced manipulator was designed for mechanizing loading-unloading technological positions with the participation of an operator.

Specifications	
Load lifting capacity, kg	
nominal	80
maximum	100
Working zone:	
height, m	0.2-1.8
radius, m	0.6-2.5
rotation around vertical axis, degree	360
Number of degrees of mobility	4
Operator forces, newtons:	
along vertical	40
along horizontal	40
turning around vertical axis	15
Type of drive	Pneumatic
Installation version	On column without supports, on column with supports, suspended version
Manipulator weight, kg	350

The manipulator eases the work of basic production workers on heavy monotonous work, and raises the standard and culture of production.

Annual saving is 1500 rubles per manipulator.

Address for requesting documentation and data in 107053, Moscow, B-53, TsNIIinformatsii.

The device for mounting dies is designed to ease operations of mounting heavy dies on the press table and removing them by replacing the sliding friction of the bearing surface of the die on the surface of the table by the rolling friction of the fulcrum balls of the device.

The set of the device contains two frames inserted into two grooves of the press table. Roller bearings are positioned in each frame along with floating pistons, a plunger and a clamping screw. The floating pistons, located in communicating holes of the frame, rise by the pressure of the working medium. The pistons lift the fulcrum balls which, in turn, lift the die above the surface of the anvil cap so that the load is moved by rolling it along the fulcrum balls.

The loads on the balls are uniformly distributed by the presence of a hydraulic system with communicating channels. This improves the operating qualities of the device.

The address for requesting documents and data in: 198188, Leningrad, L-188, TsNII "Rumb."

MRLU-200-901 linear-angular manipulator is designed for loading-unloading and basic technological operations for assembly, die forging and metalworking production facilities in robot equipment complexes and automatic assembly machines and lines.

Specifications	
Load lifting capacity, kg	0.5
Linear motion, mm:	
horizontal	200
vertical	60
Grip rotation, degrees	180
Rotation angle, degrees	20-180
Positioning accuracy, mm	±0.02
Drive	Pneumatic
Control system	ESU-901
AC power supply:	
voltage, volts	220
frequengy, Hz	50
Pressure in pneumatic network, megaPa	0.2-0.4
Size (without control system), mm	595 x 322 x 378
Weight, kg	26

One manipulator saves 10,000 rubles.

Address for requesting documentation and data is 107005, Moscow, B-5. "Volna" Scientific Technical Information Center.

A loading manipulator with an MP-100G hydraulic drive is designed for mechanizing loading-unloading operations related to transferring heavy products, setting up intermediate products and removing parts from equipment in series, large series and mass production.

The hinged-lever mechanism of the manipulator, mounted on a column, can rotate around a vertical axis.

The load is lifted or lowered by a hydraulic drive with a stepless change in the speed of movement when the control lever, placed directly at the grip device, is turned.

Unlike existing designs, the manipulator drive is hydraulic, contains a hydraulic station built into the column controlled by a servo slide valve and a hydraulic power cylinder.

Specifications

Load lifting capacity, kg	100
Load motion, mm:	
vertical (maximum)	1600
horizontal	2500
Rotating angle around vertical axis, degrees:	
lever mechanism	350
load unit	360
Maximum speed of vertical motion of load, mm/sec	200
Regulation of vertical speed motion	Stepless
Resource in hudraulic system, megaPa	4.0
Power of electrical motor for hydraulic station, kw	1.5
Size, mm	1200x580x4400
Weight, kg	500

Address for requesting documentation and data is: 107005, Moscow, B-5, "Volna" Scientific Technical Information Center.

2291
CSO: 1823/54

UDC 658.527,011.56:621.865.8+621.735.32.016.3.06-52

MODULAR DESIGN, VERSATILITY OF ROBOTS VIEWED

Moscow MASHINOSTROITEL' in Russian No 3, Mar 84 p 14

[Article by V. V. Tochilkin, engineer, and Yu. I. Melent'yev, doctor of technical sciences, professor, "The Robotized System" in the column "Production Mechanization and Automation".]

[Text] The widespread introduction of robot systems in various branches of industry raises the problem of their application in existing "old line" production environments. The presence of established communication between production sector elements and the well-defined, fixed movement of production equipment complicate the introduction of industrial robots in these conditions. The development of compact industrial robots based on modular components allowing the robots to work in various production sectors with fully usable degrees of movement is essential to solving this problem.

A manipulator arm (a.s. 1021596) based on elastic power/drive modules (2, Fig 1) mounted on articulated links (1, 5 and 6). Each of the modules has a flexible (e.g. steel) belt (4) with a thickness of 0.25-0.75 mm, hinged to the links, and a resilient, elastic power unit (3) located between the manipulator arm links and the flexible belt.

The robotized cold-stamping production system (see plane view [a] in Fig. 2) is made up of a robot (3), a three-cassette blank supply unit (6), a blank surface wetting unit (5), a loader (2) and a press (1). All system components except the press are mounted on a mobile support base (4). In the starting position one blank (weighing 0.3-1.5 kg) is located in the wetting unit and another is dispensed by the supply unit in the vertical position.

Within the robotized production system the industrial robot manipulator is made up of two modules with a number of degrees of movement: the manipulator arm swing module and the manipulator arm assembly movement module (based on a peristaltic drive mechanism). The swing module has two interconnected arms (3, Fig. 2b) with articulated, connected links (2 and 6) attached to the transport module's base (1) (see item 4 in Fig. 2a). Flexible, elastic power/drive modules (5) are attached to the links. The tools--vacuum gripper devices (4)--

are attached to the other ends of the arms. The transport module's mobile base (1) is located in the extreme right-hand position.

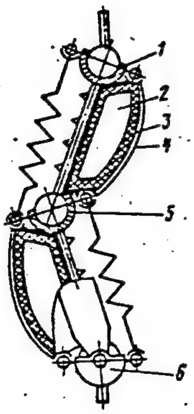
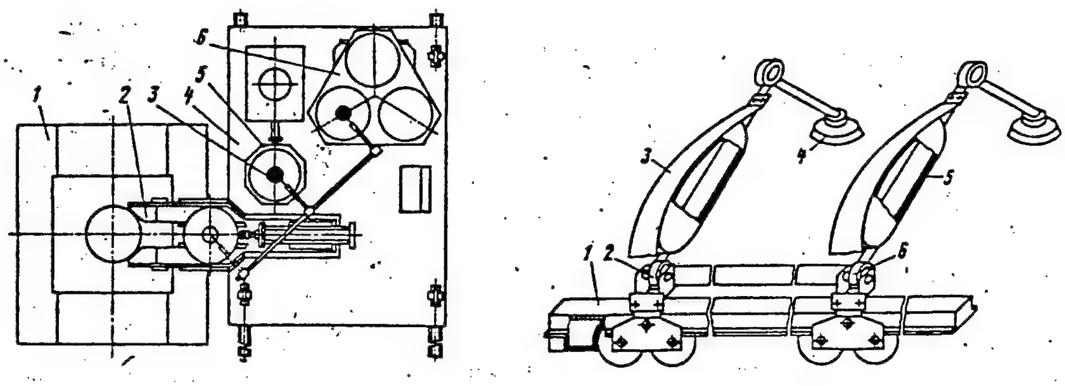


Fig. 1



a) b)

Fig. 2

Air at a preset working pressure is fed to the elastic power modules. The manipulator's gripper devices are raised to their highest position. In the process of reducing pressure in the power units and lowering the manipulator arms, electropneumatic valves are operated to feed air through the vacuum gripper ejectors. The gripper unit is attached to the manipulator arm by a hinge allowing the unit to adjust itself relative to the blank's surface. After grasping the blank, air is fed to the modules' power units. Then, as the belts begin to flex they cause the manipulator arm movable links to turn relative to the links attached to the mobile base. As the arms rise, air is fed to the peristaltic drive mechanism and the interlocked arms move, together with the mobile base, to the extreme position, carrying the blanks to a new position. In the extreme left-hand position the manipulator arms are lowered and, simultaneously, the air supply through the gripper ejectors is stopped. The blanks are released into the wetting unit and the press loader and the manipulator returns to the starting position.

The use of elastic drive units in the swing modules removes the need to employ rapidly failing components such as sliding seals on hydraulic and pneumatic cylinders. The efficient use of space by drive module elements allows the working medium to be delivered at a pressure lower than that acting on the plunger of a cylinder-activated manipulator at these same loads. This reduces the weight and size of the manipulator arm and assures greater reliability for all its components. The modular concept of degrees of movement and their mutual positioning allow the manipulator to work in a broad range. The manipulator's modular design thus allows efficient use of work space, an

improved level of technical service and improved operating conditions through rapid and simple manipulator component replacement. As a result, total system reliability and smoothness is increased.

12746
CSO:1823/317

PROCESS CONTROLS AND AUTOMATION ELECTRONICS

UDC 681.3; △ 681.61.062

INTEGRATED CONTROL SYSTEM FOR FMS COMPONENTS

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian, Jun 84 pp 18-19

[Article by S. A. Marchenko and V. G. Bril', engineers: "UPM-722 Coupling Device with SM-1, SM-2 Control Computers"]

[Text] At present, robot technological complexes RTK within automatic FMS that make it possible to produce equipment operating with unmanned technology, require great attention.

The practice of introducing RTK and FMS in metallurgical and transport machine-building indicates that UVK [Control Computers] M-6000, SM-1 and SM-2 are used to control the FMS, while UPM-552 and UPM-772 NC, not related to the UVK, are used to control positional manipulators. This causes some difficulties because of the insufficient flexibility in manipulator control. FMS production is characterized by a wide nomenclature of products and the small quantity of machined parts in a lot. Therefore, a frequent change in the control programs and their correction is required. NC devices that have a limited memory and a rigid logic are not capable of executing these operations independently. In this connection, a requirement arises in developed multilevel manipulator control systems (SU). In particular, the problem of controlling several manipulators by the UVK is of great interest.

As a rule, a centralized or combination control method is used to control a group of manipulators by the UVK. The first method is characterized by the fact that if the UVK or its individual functioning components fail, manipulator control is lost fully or partially.

The second method is distinguished by the fact that each manipulator has an individual SU coupled to the UVK. In this case, if an individual SU fails, control of only one manipulator is lost while if the UVK fails, individual SU are changed over to an independent operating mode.

In spite of the high cost of the second method, its advantages are obvious. However, at present, domestic industry does not organize the production of positional NC devices for manipulators, suitable for operation in the DNC mode [Direct Numerical Control].

The authors of this article developed a solution for coupling NC UPM-772 to SM-1 and SM-2 UVK. The solution is based on the fact that in the UPM-772, communications between the computer and the unit for controlling the memory on a cassette magnetic tape BU KNML are organized over a standard type "2K" communications channel. Communications between UVK devices are also implemented over such a channel. This makes it possible to organize communications between UVK and UPM-772 devices using a standard receiver-transmitter included as a component in the UVK -- an MVS-A723-5/1 intra-system communications module.

On the UVK side, communications are provided by standard apparatus and software (driver of the intermachine exchange through the MVS, included in the UVK software). On the UPM-722 side, communications are provided by the MVS control circuit board. The block diagram for communications is shown in Fig. 1.

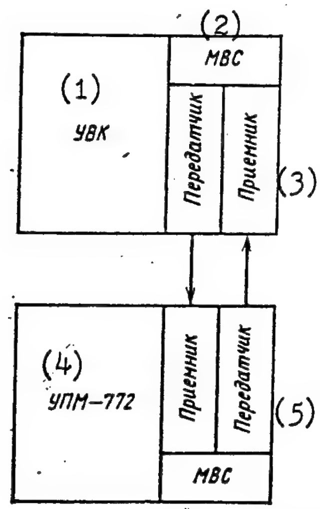


Fig. 1. Block diagram of communications between UVK and UPM-772. 1 -- UVK; 2 -- MVS; 3 -- receiver; 4 -- UPM-772; 5 -- transmitter.

The operation between the UPM-772 and the UVK is according to the same algorithm as for the BU KNML, i.e., the UVK plays the same role of an external memory of the UPM-722, that saves control programs. However, it becomes possible to intervene in these programs for their operational corrections. The exchange begins on the initiative of the UPM-772 and occurs in zones, 96 frames by 24 bytes (the zone size is determined by the capacity of the direct access memory of the UPM-772). This is the advantage of the UPM-772 as compared to the APS-1 device, where when working with a computer, a frame-by-frame output of the control program occurs. Data can be transmitted not only from the UVK to the UPM-772, but control programs, formed in the process of training, can also be transmitted in the reverse direction.

The possibility of independent UPM-772 operation is preserved. A swtich is used to switch operating modes.

The MVS control circuit board switches channels when operating modes are changed, as well as forming and issuing control signals to MVS. Fig. 2 shows a part of the electrical circuit diagram of the circuit board for the MVS control that forms and issues control signals. The memory operating mode register which stores the data on the operating mode of the communications device, received from the computer, is made of IS, D1.1, D2 and D3.1 integrated circuits. 1S, D1.2, D3.2, D3.3, D4, D5 and D6 make up the control circuit that determines the exchange operation sequence. 1S, D1.3, D1.4, D7, IS, D3.3, D3.4, D3.5, D8 and D9.1 form control signals for MVS, for forming and storing indicators of the execution of operations. This information is sent to the computer.

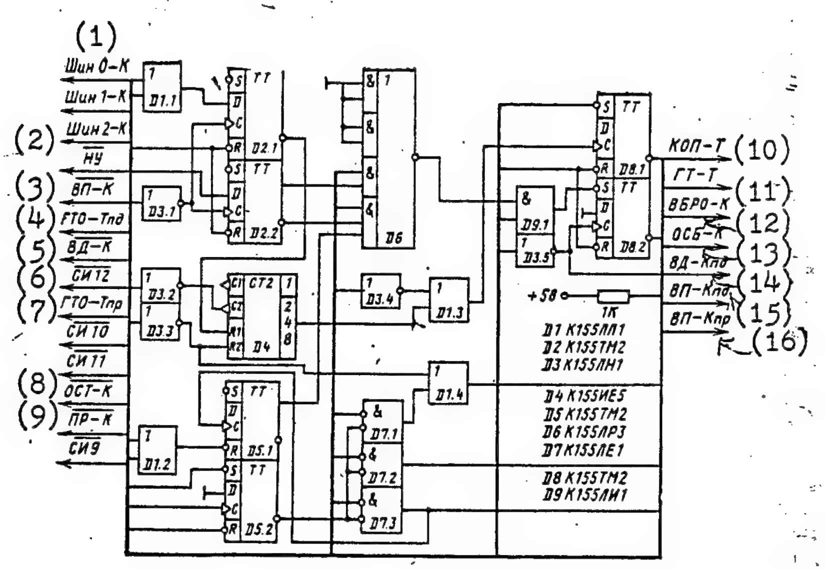


Fig. 2. Part of electrical circuit diagram of circuit board for controlling the MVS.

1 -- Bus O-K; 2 -- NU; 3 -- VP-K; 4 -- GTO-Tnd; 5 -- VD-K; 6 -- SI12; 7 -- GTO-Tpr; 8 -- OST-K; 9 -- PR-K; 10 -- KOP-T; 11 -- GT-T; 12 -- VBRO-K; 13 -- OSB-K; 14 -- VD-Kpd; 15 -- VP-Kpd; 16 -- VP-Kpr.

Modifying the UPM-772 NC device on the basis of the proposed principle for organizing communications will have the following advantages as compared to the usual type of such devices: practically unlimited memory for control programs (the program library is stored in the UVK); the possibility of correcting existing and synthesizing new control programs in the UVK; increasing the speed of operation of searching for necessary data on the magnetic tape is not required); higher reliability (mechanical units are eliminated from storage on a cassette magnetic tape).

NC UPM-772 devices, modernized on this principle, may be used to create multilevel SU groups of manipulators within RTK and FMS.

2291
CSO: 1823/96

TECHNOLOGY PLANNING AND MANAGEMENT AUTOMATION

UDC 331.875.4:658.562

NEED FOR COMPUTER-AIDED PRODUCTION PLANNING NOTED

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 6, Jun 84 pp 33-34

[Article by engineer G. Yu. Ablina: "Trends for Improving Data Processing for Analyzing Output Production and Realization in Automated Enterprise Management Systems"]

[Text] In spite of the ever expanding capabilities of organizing the solution of problems of analyzing output production and realization on the basis of information received and processed in automated enterprise management systems, its collection and summarization by specialists of economic planning services, economics and production organization laboratories and economic analysis laboratories is done manually One of their most important functions is the analysis of plan fulfillment according to periodic accounting data. Already a shortcoming in organization is being detected here, such as the lack of the possibility of conducting operations analysis being based frequently on data not recorded in operational accounting but existing in the information stores of automated enterprise management systems (ASUP's). Another shortcoming is performing analysis only according to a program created beforehand, not providing for information differentiation depending on the level of control and the specifics of the work of the specialist receiving the analytical summaries. The procedure of analyzing output production and realization is still in the stage of development; therefore, questions of regulating analytical calculations are important. Their importance is determined by the need to develop a basis for conducting a comparative analysis of the activities of individual production subdivisions and enterprises as a whole. The lack of procedures for conducting a comprehensive analysis using automated system equipment should be considered a shortcoming. Sectorwide procedural guidance materials for ASUP's recommend a distributed processing of data on analyzing output production with the framework of various ASUP subsystems and cannot sufficiently satisfy user needs. Analysis indicators are not examined to the full extent, and there is not systematic study of permissible limits, reasons and sources of the deviations. In light of this, a comprehensive analysis is not being made of plan fulfillment of an enterprise and its subdivisions, which would be desirable for making management decisions. The basis for conducting the analysis has decisive importance; it is information reprocessed in an automated system.

The results of the work of analysts and the extent of satisfying the needs of management workers depend on the quality and methods of obtaining information for analysis. Plans of output production and realization and accounting and statistical reporting data are the primary and reliable sources today. However, orientation only on them and the manual method of data processing results in the loss of efficiency in compiling and receiving analytical summaries and a limitedness of analysis means. Searches for solutions to this situation lead either to the use of current data on output production and realization being recorded in worker logs, card files and entries of functional workers, which is practically impossible without computer data processing, or to the development of a specific system of acquiring, storing and processing information on the basis of ASUP equipment. In practice there exist several approaches to putting such a system into effect.

With a decentralized approach toward automation of processing output production and realization analysis data, when analytical tasks are distributed over the corresponding functional ASUP subsystems, the process of obtaining information from other ASUP subsystems for comprehensive analysis and establishing logic and informational links between the tasks being examined are made difficult and often impossible. Also noted is a considerable duplication of information in the various subsystems which leads to a superficial analysis, not making it possible to make management decisions without additional information processing. As a rule, it yields only a quantitative assessment of plan fulfillment according to one or another indicator without determining the degree of influence of individual factors and identifying output production and realization potential. Thus, out of 13 tasks reflecting plan fulfillment for output, shipment and product quality at the Frezer Plant, only 5 provided estimates of the absolute and relative extent of plan fulfillment and 3 cited plan and accounting data without computing deviations. The remaining tasks (they were provided not only for accounting workers, but also for the production control division, the technical control division, shop management and enterprise management) record only the actual state of affairs, whereas it is namely information about deviations with their detailed breakdown that has the greatest value for making decisions.

The tasks are spread over three ASUP subsystems: operational control of basic production, control of product marketing and product quality control, which negatively affects the development of a system of organizing arrays devoid of a considerable duplication of information and ensuring comparability of data.

With the combined approach, involving the processing of output production and realization data predominantly within the framework of one of the ASUP subsystems, a number of the shortcomings of the decentralized method are eliminated. It becomes possible to establish links between the tasks, and processing of the data can be done on the basis of unified arrays of information At the same time, there still is no system to conducting the analysis, and it is difficult to estimate the influence of indicators for labor, materials and production equipment on the results of production. Thus, within the framework of the ASU-ZIL subsystem of planning and calculating basic production, it provides for completion of 10 tasks on analyzing plan fulfillment. Management workers of the enterprise's shops and subdivisions

have the ability to obtain information in the form of printed tables and reports as well as in the form of videograms in the automated system's response to a specific inquiry by the users. The data presented includes not only information about the plan and actual output, but also deviations from the plan and an estimate of the minimum and maximum daily rate of output, taking into account plan fulfillment in preceding periods. One should note the lack of information on the degree of influence of some or other parameters on the production indicators for which there are deviations more than permitted.

The centralized approach to processing output production and realization analysis data makes it possible to complete tasks within the framework of a single comprehensive economic analysis subsystem, but presently it has not yet found practical application. It creates the possibility of a systematic approach to automation of processing output production and realization analysis data by volume as well as by products list and quality of products being produced based on information concentrated in the automated data bank. An analysis of the make-up of the output production and realization analysis data base made it possible to ascertain its non-uniformity. Filling and operating the base have their own characteristics according to time and objectives. In this connection, the informational model of the system should be based on blocks accordingly with the time of data use. An analysis of the system of logical links between requisitions of the indicators designated for output production and realization analysis determines the structure of the data base in the form of a network.

Each of the approaches indicated assumes the availability of a certain composition of computer equipment, and the higher the integration of data processing, the more complex the equipment composition must be to ensure solution and output of information for tasks of analyzing output production and realization. The availability of medium or large third-generation computers or systems of small and micro-computers is mandatory, ensuring realization of the data bank concept. For developing an operations analysis system (precisely this type of analysis brings the best results in the output production control process), one should use equipment for collecting and transmitting information, making it possible to inform management workers directly about deviations which occur and their causes.

Modern systems of processing output production and realization analysis data require the appropriate programs. The most acceptable ones for this equipment are the SUBD BANK-OS, SETOR, INES and their modifications. In addition, one should provide for the possibility of developing and using an applied program package of comprehensive economic analysis of an industrial enterprise since, unlike sectorial levels, at this level of management of the national economy such developments are lacking.

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CSO: 1823/93

END